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THE EELGRASS SITUATION ON THE AMERICAN PACIFIC COAST

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Since the abrupt and unprecedented diminution of eelgrass on the Atlantic coast, numerous requests for information on the condition of eelgrass on the Pacific coast have been received. During the past few months printed reports have given evidence of a scarcity of this important submerged aquatic waterfowl food plant at a number of west coast bays. It was reported that this food scarcity was causing birds that normally remain in salt water to come inland to feed. Incidentally this has been a common occurrence along the east coast since the onset of the eelgrass scarcity. Until recently many have held that a Mycetozoan (*Labyrinthula*) was the organism responsible for the widespread wasting disease of the east coast eelgrass. Because ships commonly carry water as ballast, and because shellfish are frequently transplanted from the east to the west coast, it has been feared that the causative organism, if such existed, might inadvertently be introduced into these waters. Consequently with this feeling that there was a distinct possibility of the "wasting disease" developing on the west coast, it was felt that the recent reports of the Pacific eelgrass scarcity might be well founded; therefore, it was deemed advisable to obtain reliable information on the true status of the plant.

On July 21, in company with Mr. James Moffitt, of the California Academy of Sciences, the writer made an inspection of eelgrass conditions at Tomales Bay, Marin County, California. Many "slicks" were noted where the "grass" came to the surface of the water and

made it impossible for a motorboat to travel through it. Careful inspection was made of rhizomes of the plant as well as of those parts occurring above the surface of the mud. No characteristic spotting or streaking was noted on the underground parts or leaf blades, as is so common with the diseased eastern coast plants.

During the first week of July, Mr. T. H. Scheffer, retired associate biologist of the Biological Survey, made an inspection of conditions at Grays Harbor and Willapa Harbor, Washington, and reported that he could find no evidence that any disease has been or is affecting the eelgrass. From contact with a number of experienced and reliable oystermen who are constantly working along the coast he obtained complete confirmation of his findings. He writes further: "Everywhere along the coast reports of observers, whether scientifically inclined or not, indicate that there were unusually large flights of brant and geese the past spring, and that many flocks remained for extended periods. Naturally these waterfowl gathered in such numbers on the tide-land meadows as to attract attention, particularly at times when the eelgrass beds were less accessible on account of the higher tides. A case in point was the gathering of large flocks of brant on tide-land meadows that could be observed from the office of the South Bend Journal, where the report, of which you received a clipping, originated."

Reports of conditions along the coast of British Columbia have recently been received from Mr. J. A. Munro, Chief Federal Migratory Bird Officer, B. C., Dr. W. A. Clemens, Director, Pacific Biological Station, Nanaimo, B. C., and Dr. Irene Mounce, Assistant Plant Pathologist, Division of Botany, Department of Agriculture, B. C., Canada. Mr. Munro states that he "observed no reduction of eelgrass this spring while on Vancouver Island and found black brant in large numbers on their usual feeding grounds." Dr. Clemens writes as follows:

"Although *Labyrinthula* has been identified from the eelgrass in Departure Bay, there is no evidence of a decrease in the amount of growth on the eelgrass beds at the present time. Furthermore last fall I requested the Department of Fisheries to ask the fishery inspectors along the coast to report on the grass beds of their respective districts and no reports indicated a lessened amount. We are watching the situation and so far there is no sign of an epidemic in the eelgrass beds along the Canadian coast."

Dr. Mounce writes under date of September 9, 1938 that she has recently made personal observation only at Royston, Vancouver Island, B. C., and concluded that "There seemed to be no noticeable change in the amount of grass" and that the people living along this coast concurred with this view. She added further that the amount present was "certainly as much as I remember some years ago." In September 1937 she also informed us that their department had no reports indicating "any decrease" in eelgrass at Departure Bay.

From Alaska, Regional Director Frank Dufresne indicates that eelgrass conditions are normal. His warden, Jack Benson, reports that eelgrass was noted in December 1937 (and apparently was in healthy condition) at Nelson Lagoon adjacent to Bering Sea. At a later date at Morjhovoi, Cold and Pavlof Bays, Alaska Peninsula, he found waterfowl and their food in abundance and adds that "an abundance of eelgrass was noted in many places along the Alaskan Peninsula."

We have no authentic data indicating any disease or reduction of eelgrass along the Pacific coast.

Dr. Harrison F. Lewis, Chief Federal Migratory Bird Officer of Ontario and Quebec, wrote under date of September 9, 1938 that he has observed no noticeable change in the scarcity of eelgrass along the north shore of the Gulf of St. Lawrence.

Concerning the condition on the English coast, Dr. A. D. Cotton of the Herbarium, Royal Botanic Garden, Kew, Surrey, England, informed us on August 26, 1938 that he "believed the situation is somewhat easier" than it has been in recent years.

Dr. F. Borgesen of the University Botanical Museum, København, Denmark, on September 5 of this year wrote that along their coast the eelgrass seems to be slowly recovering. He reports that at a number of localities he has found apparently healthy plants. At Hellebock (north of Elsinore) after a prolonged wind, he has for the first time since the outbreak of the disease, found a good deal of eelgrass drift.

Since our April summary of the eelgrass situation along the Atlantic coast (published as Leaflet BS-110, Status of Eelgrass (*Zostera marina*) on the North Atlantic Coast, February 1938) it may be stated that some improvement has been noted. A recent (July and August) inspection of eastern Maine indicates an encouraging improvement, although the disease is still in evidence. In general, areas of reduced

salinity are making a good return. The present condition lends encouragement to the hope that the devastating "disease" will eventually pass and that the west coast plants will not succumb to the malady.

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ENVIRONMENTAL FACTORS AND THE WASTING DISEASE OF EELGRASS

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The causes of the wasting of eelgrass (*Zostera marina*) on both sides of the Atlantic continue to be the subject of investigation and speculation. Workers in the United States and in Great Britain now appear to be in agreement that whatever parasite or parasites may be associated with the disease, we are (5 p. 68) "forced to look for an explanation of the wide-spread disappearance of *Z. marina* in the ecology of the plant itself," or as Young states (6 p. 25), "A universal shift of some one or more environmental factors upsetting the physiological balance of *Zostera* or of its parasite, *Labyrinthula*." The writers quoted differ, however, as to the particular environmental factors which they regard as the most likely to be significant. Young points out a possible relation between the "local variations" in the amount of eelgrass observed throughout the diseased areas and changes in the salinity. Tutin, on the (5 p. 68) other hand, relates the sudden wide-spread disappearance to the fact that "In the British Isles the year 1931-32 showed a sunshine deficiency of about 20% below normal, and no other year in the past ten showed a deficiency approaching this." Atkins has challenged the validity of this conclusion and after reviewing the percentage of normal sunshine at various stations in the British Isles since 1897, concludes that (1 p. 209), "There is certainly no ground for attributing its [*Zostera*'s] disappearance to any decrease in illumination leaving the plant, thus weakened, an easier prey to disease."

Neither writer considers sunshine data from the United States. It should be remembered that the sudden wasting of eelgrass was a very widespread phenomenon, and that any environmental factor or factors, in order to be worth considering in this connection, must be shown to have prevailed over a very large area. Fortunately, the